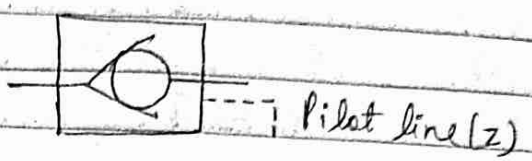
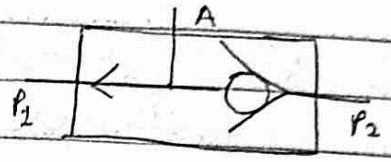
HYDRAULIC POWER SYMBOLS :-

1) Simple NRV (non return valve) 

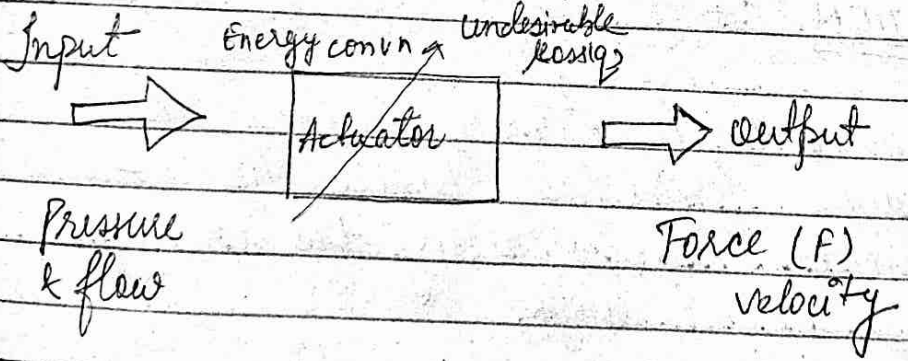
2) NRV spring loaded 

3) Pilot to open check valve 

4) Double check valve or Shuttle valve. 

ACTUATORS :-

Actuators are very important and irreplacable too or constituents in the fluid power system that involves a linear and rotatory motion.
Actuator is design design to deliver a desire motion when it is driven by a power source.
It is a device establishing an energy for b/w the input port and the output port.



Main Requirements :-

1) Large travel
2) High precision
3) Fast switching
4) Low power consumption

Microactuators

- Electrostatic actuator
- Electromagnetic actuator
- Piezoelectric actuator
- fluid actuator

→ Electrostatic actuator
It uses an electrostatic force for an actuation.

→ Electomagnetic Aectuator
It uses an electromagnetic force for an actuation.

→ Piezoelectric
It uses piezoelectric effect used for actuation.

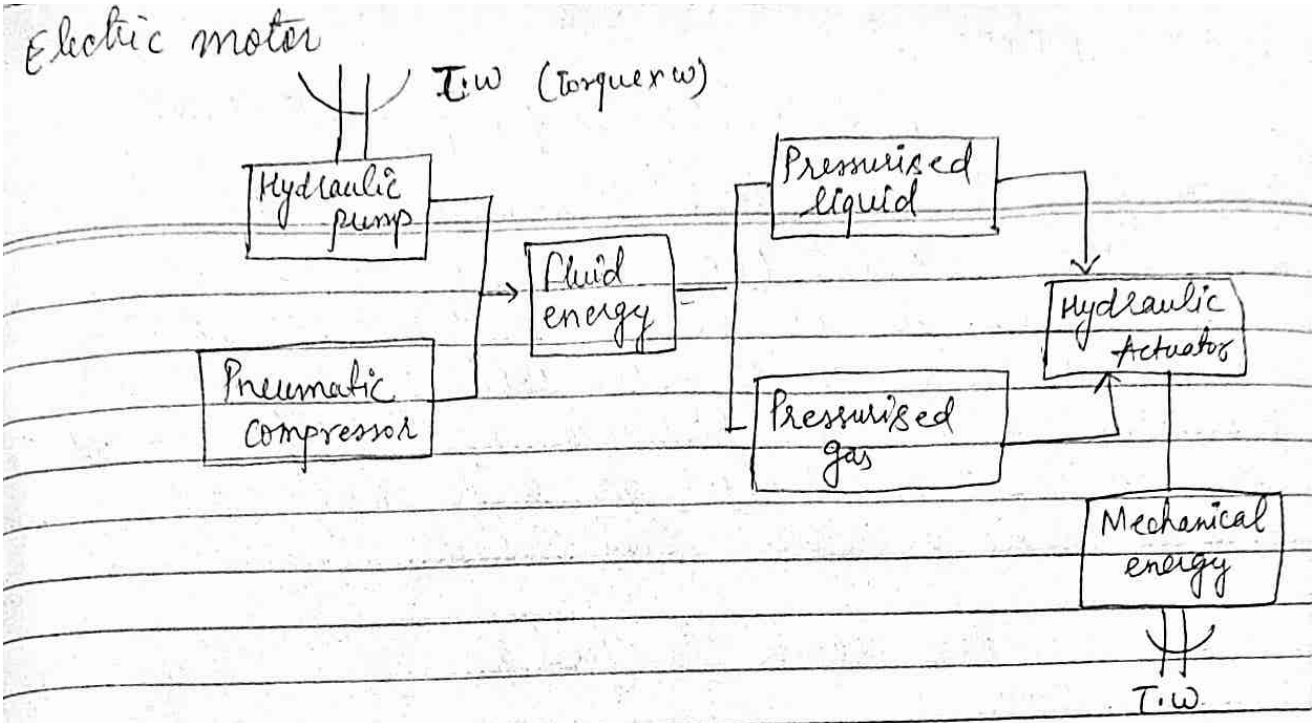
→ fluid Actuators.
uses liquid gas & plasma for actuation.

* FLUID POWER ACTUATION :-

A pump / compressor perform the function of adding the energy to the hydraulic fluid / air while the actuator do the opposite functions ie extracting the energy from the fluid to the useful work.

Pump Compressor :

↳ fluid or energy / hydraulic ⇌ (Pump/compressor; Actuator) Mechanical energy



Fluid power actuators can be classified as :-

1) Hydraulic cylinders / Pneumatic cylinders.
   To produce linear motion force (F) and velocity (V)

2) Hydraulic motors / Pneumatic motor
   To produce rotatory motion Torque (T) and speed (N)

3) Linear rotatory motors or oscillation motor
   To produce reciprocation motor.

Major Applications of actuators :-

1) Hydraulic jets
2) Dumpers
3) Earth moving an construction equipment
4) Automobile hosting
5) Aircraft landing gear.
6) Brakes, Flaps, Spoilers.

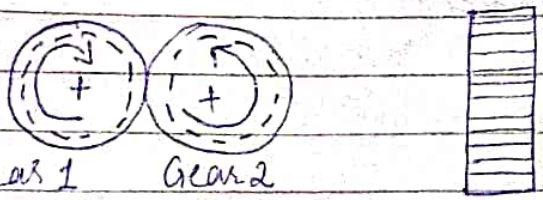
HYDRAULIC MOTORS :-

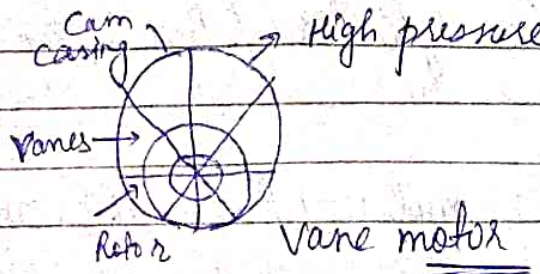
Instead of pushing on the fluid as the pump do motors are pushed upon by the fluid ie oil pressure pushes the freely moving elements (Gears / vanes / pistons).

Hydraulic motor develop torque and produce continues rotatory motion use to carry out works of different nature since the casing of the hydraulic motor is pressurised from a outside source most hydraulic motors have casing drain to protect shaft sheilds.

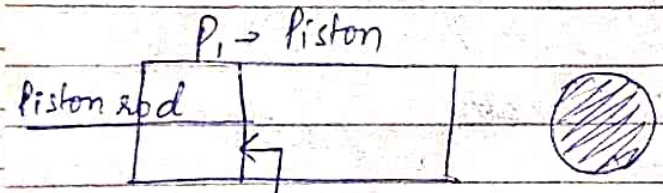
Hydraulic motors can be classified as

1) Gear motor
2) Vane motor
3) Piston motor





Vane motor



Projected area (circular)

Piston motor

1) $Q_{th} = Vol^m \times speed$

2) $T_{th} = \frac{VD \times Press}{2\pi}$

3) $P_{th} = \frac{2\pi NT}{60 \times 10^3}$

Q A hydraulic motor has a volumetric displacement of 123 cm³. If it receives 0.0009 m³/sec of oil at 50 bar pressure. (i) find the speed of motor (ii) theoretical torque (iii) theoretical power.

Sol^n $P = 50$ bar

$0.0009 = 123 \times$ speed

$\frac{9 \times 10^{-3}}{123 \times 10^{-6}}$ speed $\Rightarrow 0.0731 \times 10^{-3} \times 10^{6}$

$\Rightarrow 0.0731 \times 10^{3}$

$\Rightarrow 0.731 \text{ m}^2/\text{s}$

$\Rightarrow 439$ rpm

(ii) $\frac{123 \times 10^{-6} \times 80}{2 \times 3.14 \times 10^{-2}} = T_{th}$

$T_{th} = \frac{123}{314} \times 10^{-4} \times 25$

$= 9.79 \times 10^{-4} \Rightarrow 979 \times 10^{-6} \times 10^{5}$

$\Rightarrow 97.9$ N.m.

(iii) $P_{th} = \frac{2 \times 3.14 \times 439 \times 97.9}{60 \times 103 \times 103}$

$\Rightarrow 4.498$ KW